

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

20 DEC 2004

Applicant's or agent's file reference WO 37794	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/B 03/02326	International filing date (day/month/year) 17.06.2003	Priority date (day/month/year) 18.06.2002
International Patent Classification (IPC) or both national classification and IPC F16H63/30		
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA et al.		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- | | | |
|------|-------------------------------------|--|
| I | <input checked="" type="checkbox"/> | Basis of the opinion |
| II | <input type="checkbox"/> | Priority |
| III | <input type="checkbox"/> | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| IV | <input type="checkbox"/> | Lack of unity of invention |
| V | <input checked="" type="checkbox"/> | Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI | <input type="checkbox"/> | Certain documents cited |
| VII | <input type="checkbox"/> | Certain defects in the international application |
| VIII | <input type="checkbox"/> | Certain observations on the international application |

Date of submission of the demand 22.08.2003	Date of completion of this report 26.08.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Truchot, A Telephone No. +31 70 340-4782 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/B 03/02326**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-22 as originally filed

Claims, Numbers

1-7 received on 24.11.2003 with letter of 24.11.2003

Drawings, Sheets

1/7-7/7 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-7
	No: Claims	
Inventive step (IS)	Yes: Claims	1-7
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations

see separate sheet

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Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following document:

D1: US-B-6 382 3821 (COWAN RONALD THOMAS ET AL) 7 May 2002 (2002-05-07)

The subject-matter of independent claim 1 differs from the dual connecting and disconnecting apparatus known from document D1, which is regarded as being the closest prior art, in that:

- among the first and second engaging devices, the friction member of the one friction engaging device arranged on the side opposite the first direction side in the axial direction is prevented from the first direction side from moving in the first direction by a spacer fitted to the connecting drum so as to be non-rotatable with respect thereto, and
- the friction member on the connecting drum side of the other friction engaging device positioned on the first direction side is fitted to the spacer so as to be non-rotatable with respect thereto, and is prevented, along with the spacer, from moving in the first direction by the stopper member.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as providing a stopper member for the friction member of the one friction engaging device arranged on the side opposite the first direction side which:

- leads to a reduction in the overall axial length of the connecting drum; and
- does not interfere with the piston actuating the other friction engaging device.

The solution to this problem proposed in independent claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

By using the claimed spacer arrangement to prevent the friction members of the one friction engaging device from moving in the first direction, the use of an additional snap ring attached to the connecting drum and located between the two friction engaging devices (as known from document D1) is not required any more to hold said friction members in position. The axial distance between the two friction engaging devices can

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therefore be decreased, which results in a reduction in the overall axial length of the connecting drum.

Furthermore, if an additional snap ring is used as shown in D1, its radial dimension must be increased so that the snap ring can both engage with the friction members of the one friction engaging device and be compressed in the radial direction into an annular groove of the connecting drum without interfering with the piston of the other friction engaging device. When the spacer arrangement is used, however, its radial dimension only needs to be equal to the dimension required to engage the friction members of the one friction engaging device. Therefore, the potential appearance of interference is eliminated.

Claims 2-7 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step (Article 33(2) and (3) PCT).

amended Claims

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Enclosure November 24, 2003
International Application No.: PCT/IB03/02326
Applicant: TOYOTA JIDOSHA KABUSHIKI KAISHA
Our ref.: WO 37794

WHAT IS CLAIMED IS:

1. A dual connecting and disconnecting apparatus characterized by comprising:
 - a first hydraulic cylinder in which a piston is moved in a first direction which is parallel with an axis of the dual connecting and disconnecting apparatus by supplying hydraulic fluid into a first pressure chamber;
 - a second hydraulic cylinder which is integrally provided on a common support member and which is concentric with the first hydraulic cylinder in a position adjacent in the first direction to the first hydraulic cylinder, and in which a piston is moved in the first direction by supplying hydraulic fluid into a second pressure chamber;
 - a cylindrical connecting drum provided on a side wall portion of a cylinder tube of the first hydraulic cylinder integrally mounted to the support member, the connecting drum being centered around the axis and extending out in the first direction;
 - a first friction engaging device positioned farther to the first direction side than the second hydraulic cylinder, the first friction engaging device comprising (i) a first friction member provided on the connecting drum, this connecting drum being rotatable around the axis with respect to a first connecting member, the first friction member being non-rotatable with respect to the connecting drum, and (ii) a second friction member provided on the first connecting member, the second friction member being non-rotatable with respect to the first connecting member, the first friction engaging device connecting the support member with the first connecting member via the connecting drum by moving the piston of the first hydraulic cylinder in the first direction and engaging the first friction member of the connecting drum with the second friction member of the first connecting member; and
 - a second friction engaging device positioned farther to the first direction side than the second hydraulic cylinder and adjacent in the axial direction to the first friction engaging device, the second friction engaging device comprising (i) a third friction member provided on the connecting drum, this connecting drum being rotatable around the axis with respect to a second connecting member, the third friction member being non-

rotatable with respect to the connecting drum, and (ii) a fourth friction member provided on the second connecting member, the fourth friction member being non-rotatable with respect to the second connecting member, the second friction engaging device connecting the support member with the second connecting member via the connecting drum by moving the piston of the second hydraulic cylinder in the first direction and engaging the third friction member of the connecting drum with the fourth friction member of the second connecting member,

in that a cylinder tube of the second hydraulic cylinder is provided separately from the piston of the first hydraulic cylinder, and is fixed integrally to the support member, and

the first friction member and the second friction member of the first friction engaging device and the third friction member and the fourth friction member of the second friction engaging device are fitted into the connecting drum from an end portion thereof on the first direction side from the direction opposite the first direction, and are prevented from moving in the first direction by a stopper member integrally attached to the connecting drum

wherein among the first friction engaging device and the second friction engaging device, the friction member of the one friction engaging device arranged on the side opposite the first direction side in the axial direction is prevented from the first direction side, from moving in the first direction by a spacer fitted to the connecting drum so as to be non-rotatable with respect thereto; and

the friction member on the connecting drum side of the other friction engaging device positioned on the first direction side is fitted to the spacer so as to be non-rotatable with respect thereto, and is prevented, along with the spacer, from moving in the first direction by the stopper member.

2. The dual connecting and disconnecting apparatus according to claim 1, characterized in that:

among the first friction engaging device and the second friction engaging device, the friction member on the connecting drum side of the one friction engaging device arranged on the side opposite the first direction side in the axial direction is mounted to the connecting drum so as to be non-rotatable with respect thereto; and

the piston of the hydraulic cylinder that engages the friction member of the other friction engaging device positioned on the first direction side extends through a notch formed in the friction member of the one friction engaging device and abuts against the friction member of the other friction engaging device.

3. The dual connecting and disconnecting apparatus according to claim 1, characterized in that:

the first friction member and the second friction member are pressed together between the piston of the first hydraulic cylinder and the stopper member and engaged by moving the piston in the first direction; and

the third friction member and the fourth friction member are pressed together between the piston of the first hydraulic cylinder and the stopper member via the spacer and engaged by moving the piston in the first direction.

4. The dual connecting and disconnecting apparatus according to claims 1 or 3, characterized in that:

an annular flange bent at a substantially right angle away from the connecting drum so as to be substantially parallel with the friction member of the one friction engaging device is integrally provided on an end of the spacer.

5. The dual connecting and disconnecting apparatus according to any one of claims 1 to 4, characterized in that:

the spacer is prevented from moving in the direction opposite the first direction by an abutting portion provided integrally with the connecting drum so as to allow fitting of the friction member of the one friction engaging device, and is held in position between the abutting portion and the stopper member.

6. The dual connecting and disconnecting apparatus according to any one of claims 1 to 5, characterized in that:

the support member is a rotating input shaft of the dual connecting and disconnecting apparatus.

7. The dual connecting and disconnecting apparatus according to any one of claims 1 to 6, characterized in that:

the first friction member and the second friction member of the first friction engaging device are provided in plurality; and

the third friction member and the fourth friction member of the second friction engaging device are provided in plurality.